The Veterinary Record

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888.

No. 13. MARCH 29, 1941. VOL. 53.

THE RESISTANCE AND SENSITIVITY OF *BR. ABORTUS*-INFECTED GUINEA-PIGS

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It has been shown (McEwen, 1940) that infected guinea-pigs are resistant to reinfection with *Br. abortus*. In the present article further evidence of this immunity is presented together with evidence of the sensitisation of infected guinea-pigs to the inoculation of *Br. abortus*.

Sixteen normal guinea-pigs were each inoculated intramuscularly in the posterior part of the thigh with 1 c.c. of a suspension of strain 161 equivalent in opacity to No. 10 tube of the Brown's scale. This strain is aerobic and fully virulent. The guinea pigs were killed in pairs at the following intervals after inoculation—1 hour, 2 hours, 8 hours, 48 hours, and 7 days. Tissues from the following organs were sown on to liver agar slants and incubated aerobically: spleen, liver, kidney, right and left precrural lymphatic glands, right and left popliteal lymphatic glands and right and left iliac lymphatic glands. *Br. abortus* was cultivated on every occasion from all of the tissues examined.

A group of guinea-pigs was infected by inoculating each animal subcutaneously with 0·25 c.c. of a suspension of the CO_2 sensitive and virulent strain 544; the opacity of the suspension was similar to that of tube 3 on Brown's scale. Two weeks later two of the infected guinea-pigs were each inoculated intramuscularly in the popliteal region with 1 c.c. of a suspension of strain 161 equivalent in opacity to tube 10 on the Brown's scale. These two guinea-pigs were killed one week later and cultures were made from the tissues enumerated in the preceding paragraph. In one case strain 161 was recovered only from the pus that was found at the seat of inoculation; in the other case the strain was isolated from the same site and from the precrural and iliac lymphatic glands draining the inoculated leg, but from no other tissue. These two guinea-pigs were therefore highly resistant to reinfection and if a generalised reinfection did occur the organisms were quickly destroyed. Both of the guinea-pigs showed relatively large abscesses in the popliteal region of the inoculated limb and in neither could the popliteal lymph gland be distinguished in or from the pus. Comparable lesions had not been observed in normal guinea-pigs inoculated intramuscularly in the same region of the thigh with similar quantities of suspensions of strain 161.

The experiment was repeated, but 0·1 c.c. of suspension of strain 161 instead of 1 c.c. was inoculated. Two normal guinea-pigs were likewise inoculated. The results of this experiment agreed with those of the previous experiment in all respects. In the reinfected animals strain 161 was not found beyond the regional lymphatic glands of the inoculated leg, and again abscesses were found in the popliteal region. The infection was found in all the organs examined from the controls and no abscesses were present in the popliteal regions.

In order to ascertain whether a blood stream reinfection rapidly disappeared from the blood and organs, suspensions of strain 161 were inoculated intraperitoneally into infected guinea-pigs. This route was selected because of the known rapid passage of organisms into the blood stream following intraperitoneal inoculation.

It had been shown that the inoculation of 5 to 50 organisms into broth resulted in the profuse growth of *Br. abortus* after three days' incubation; the growth was demonstrated by sowing 0·2 c.c. quantities of broth cultures on to liver agar slants, a confluent surface growth being obtained on these slants.

Six guinea-pigs infected with strain 544 and six normal animals were each inoculated intraperitoneally with 0·1 c.c. of strain 161. One guinea-pig from each group was bled by cardiac puncture one hour after inoculation and 1 c.c. quantities of heart blood were sown into 10 c.c. of broth; 1 c.c. of this broth was in turn inoculated into a second 10 c.c. of broth. Heart blood samples from two more guinea-pigs from each group were collected 24 hours after the animals had been inoculated and the remaining guinea-pigs were bled 48 hours after inoculation. The blood samples from all of the guinea-pigs were cultivated for *Br. abortus* and the organism was recovered from all of them. Eight days after the inoculation of strain 161 the animals were killed and tissues from their spleens, livers and kidneys were sown on to liver agar slants which were incubated aerobically. Heart blood samples were sown into broth and cultivated in the usual way. In no case was the aerobic strain of *Br. abortus* isolated from the guinea-pigs infected with strain 544, but the control guinea-pigs' tissues were all heavily infected by strain 161 and this strain was also recovered from the heart blood of each guinea-pig.

The experiment demonstrated the rapid removal of the reinfection from the blood stream and the inability of the reinfection to establish itself in the organs examined.

On *post-mortem* examination the omenta of the guinea-pigs originally infected with strain 544 presented a striking appearance. The membraneous character of this organ was lost and it appeared as a firm and thickened band of tissue, yellowish pink in colour and finely marbled in appearance due to the injection of the small blood vessels which traversed the organ in a tortuous manner. Here and there on the surface and in the substance of the band of tissue were pockets of pus. The thickening of the omentum appeared to be due in part to the folding of the organ on itself and to adhesions between its folds. From the pockets of pus the aerobic strain 161 was isolated. The omenta of the control guinea-pigs were normal in appearance. It has been shown that the changes of the omentum found in the originally infected guinea-pigs are not caused by the inoculation of strain 544 into normal animals. The omental lesions have only been observed in animals reinfected by intraperitoneal inoculation; the pockets of pus, however, may or may not be present. The omental lesions are therefore regarded as an immunity reaction shown by animals highly resistant to reinfection.

A further experiment was made and graded doses of strain 161 were inoculated into infected guinea-pigs. The results of this experiment are summarised in the following table :—

Table

Amount of Suspension of Strain 161 (opacity = tube 10 Brown's scale).	Guinea-Pigs Infected with CO_2 Sensitive Strain 544.				Control Guinea-Pigs.			
	Cultures made from Heart Blood Collected after Inoculation of Strain 161.			Spleen Cultures (7 days).	Cultures made from Heart Blood Collected after Inoculation of Strain 161.			Spleen Cultures (7 days).
	2-3 hours.	24 hours.	7 days.		2-3 hours.	24 hours.	7 days.	
1 c.c.		+	Guinea-pig found dead day after inoculation				+	+
0·5 c.c.		+	Guinea-pig found dead day after inoculation				+	+
1 c.c. of dilution 1 : 10^3 ...	C	—	—	—		+	+	+
„ „ 1 : 10^2 ...	+	C	—	—	+	C	+	+
1 c.c. of dilution 1 : 10^4 ...	+	—	—	—	+	C	+	+
„ „ 1 : 10^4 ...	—	C	C		C	C	+	+

C = cultures contaminated.

The infected guinea-pigs inoculated with 1 c.c. and 0·5 c.c. of the undiluted suspension of strain 161 were both found dead the day following inoculation and their peritoneal cavities contained an excess of fluid and had a congested appearance. The normal animals inoculated with similar quantities of culture remained apparently well until they were slaughtered. The rapid death of the originally infected guinea-pigs indicates that they were specifically sensitised to the intraperitoneal inoculation of *Br. abortus*. This sensitivity produced by the inoculation of living virulent organisms differs fundamentally from the protection that the inoculation of killed organisms or immune serum confers upon animals. These inoculations do not sensitise the animals but render them resistant to the intraperitoneal inoculation of numbers of live organisms that are lethal for normal animals (Holth 1911, Zwick & Zeller 1913, Weigman 1931, Helms 1932, Singer-Brooks 1937, Priestley & McEwen 1938).

Unfortunately the heart blood cultures from the guinea-pigs shown in Table I were contaminated in a number of instances. Nevertheless it is evident that on the intraperitoneal inoculation of even comparatively small numbers of organisms the blood stream is invaded, but in the previously infected guinea-pigs the invasion is of short duration.

The omenta of the two infected animals inoculated with dilutions 1 : 10^3 showed the characteristic changes, but the omenta of the two infected animals inoculated with smaller numbers of organisms were normal in appearance. As was to be expected, the omental changes are only found when a sufficiently large number of organisms are inoculated, but excessive numbers of organisms, instead of producing what may be regarded as a specific immunity response or reaction, kill the animals which are, at one and the same time, resistant to reinfection but sensitised or allergic to it.

The placentae of infected pregnant guinea-pigs are heavily infected with *Br. abortus*. An experiment was therefore made to try and find whether these susceptible organs were subject to reinfection.

A number of female guinea-pigs were inoculated subcutaneously with strain 544. Four weeks later male guinea-pigs were placed with these animals and also with another group of normal females. Six weeks after the introduction of the males, all the female pigs received an intramuscular inoculation of the aerobic strain 161. The guinea-pigs were later killed at intervals of 6 to 16 days. The usual organs and additional lymphatic glands, together with the placentae of pregnant animals and scrapings from the uterine mucous membrane of the non-pregnant guinea-pigs, were examined for the aerobic strain 161

Eleven originally infected and five control animals were examined; only two of the former were pregnant but strain 161 was not recovered from the placentae of either of them, nor was it isolated from the uterus of the others. All the eleven guinea-pigs still showed infection at the seat of inoculation of strain 161 and in two cases the lymphatic glands draining the inoculated leg were infected. From none of the other organs examined was strain 161 recovered. Four of the five control guinea-pigs were pregnant and infected in the placentae, as were all the remaining organs examined. It is unfortunate that only two guinea-pigs in the group of originally infected animals were pregnant. Nevertheless the evidence from them showed that reinfection of the susceptible placenta did not occur.

When infected guinea-pigs abort, abscesses are formed in the uterus which start at the areas of former placental attachment. In no other organs of the body have abscesses been caused by primary infection with either strain 544 or 161. The placentae are, however, more heavily infected than other organs and localised aggregations of large numbers of *Br. abortus* are no doubt responsible for the uterine abscesses. These aggregations of bacteria are surprising when it is remembered that the animals are highly resistant to reinfection, and furthermore, that after a time the primary infection regresses so that few, and in some cases no, organisms are recoverable from the spleen. If the infection of the foetal membranes be regarded as an infection of the hypothetically non-immune foetus, and the associated infection of the maternal placenta and uterus as a severe reinfection, the origin of the uterine abscesses falls into line with that of the abscesses caused in the omentum and elsewhere by a parenteral reinfection and each arises from the reaction of the immune body to a heavy localised infection.

Further experiments on infected guinea-pigs have shown that animals are sensitive to reinfection with the homologous strain; large doses of the strain which were not fatal for control animals caused death within 24 hours of their inoculation into the peritoneal cavity and smaller doses produced the characteristic changes of the omentum. When the homologous strain was used the inability of the reinfection to establish itself in the organs could not be ascertained by cultural means, both primary and secondary infections being caused by the same CO_2 sensitive strain.

Reinfection with strain 45 (20), which is a rough variant and of relatively low virulence, produced results comparable to those obtained by reinfection with strain 161.

An attempt was made to sensitise animals by single and also multiple inoculations of killed cultures of strain 544, of living cultures of strain 45 (20) and of living cultures of strain 45. Strain 45 is non-virulent for guinea-pigs. In no instance were the animals sensitised; they were not highly resistant to reinfection and the omental changes associated with the high resistance or immunity to reinfection were not produced.

Conclusions

Infected guinea-pigs are highly resistant to reinfection; the bacteria of reinfection are rapidly removed from the blood stream and do not become established in the spleen, liver, kidneys, placenta or lymphatic glands except in the case of those lymphatic glands draining an area where a heavy localised infection has been produced.

Infected guinea-pigs are sensitised to *Br. abortus* and die within 24 hours of the intraperitoneal inoculation of numbers of organisms that cause no marked disturbance in normal animals.

The intraperitoneal inoculation of infected guinea-pigs with large sub-lethal doses of *Br. abortus* gives rise to characteristic changes in the omentum. The organ loses its membraneous character and assumes the appearance of a thickened band of tissue that may or may not be studded with abscesses. Similar inoculations of non-infected guinea-pigs do not produce these changes.

The intramuscular inoculation of *Br. abortus* into the posterior part of the thigh of infected guinea-pigs produces an abscess in the popliteal region. Comparable inoculations given to normal guinea-pigs do not give rise to abscesses.

The omental changes, the abscesses that may be formed in the omentum and the abscesses in the popliteal space are regarded as localised immunity reactions.

Infected pregnant guinea-pigs that abort generally develop abscesses in the uterus that commence at the areas of former placental attachment. It is suggested that these abscesses also occur because of an immunity reaction to a reinfection of the maternal tissues from the infected foetal placentae.

The sensitisation of the infected guinea-pigs shown by rapid death following the intraperitoneal inoculation of numbers of *Br. abortus* which are not toxic for normal animals, differs fundamentally from, and should not be confused with, the toxic effects of the intraperitoneal inoculation of large numbers of *Br. abortus* into normal animals.

Attempts were made to immunise and sensitise guinea-pigs by single and multiple inoculations of killed cultures of *Br. abortus* and living cultures of reduced virulence, but no evidence was found of an immunity response as evidenced by changes of the omentum or of specific sensitivity to the intraperitoneal inoculation of *Br. abortus*.

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This work was assisted by a grant approved by the Agricultural Research Council.

Acton Corporation Health Committee report that it has in the past viewed with concern the number of pigs which die during transit on the railways and feels particularly in the present emergency, that greater care should be taken to prevent such waste of valuable food. It has given instructions that strong representation be made to the Ministry of Food on the matter, and that the Royal Society for the Prevention of Cruelty to Animals be requested to consider urging the railway companies to provide more humane methods of transport.—*Meat Trades Journal.*

AN ATTEMPT TO BREED FOWLS RESISTANT TO NEWCASTLE DISEASE FROM IMMUNE HENS

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Newcastle disease of fowls is responsible for enormous losses in India and elsewhere where the disease is endemic. While the diagnosis of this disease is comparatively simple, the question of the application of suitable control measures in the face of actual outbreaks has been most difficult owing to the absence in the past of any satisfactory preventive or curative treatment. This disease has a great significance in the development of the poultry industry particularly in the East, and therefore needs the closest possible attention. Attempts have been made to investigate the possibility of raising fowls resistant to the disease and some encouragement was obtained, the details of which are presented in this paper.

LITERATURE

According to Crew (1925), in a genetical sense there are no inherited diseases. He states that immunity to a disease may be acquired by an individual through the medium of its mother's milk, by contracting the disease and recovering from it, or by being inoculated with the modified virus of the disease. He considers, however, that " there is little satisfactory evidence that an immunity so acquired can be transmitted to the following generations." At the same time it is mentioned that " there is considerable evidence of a sort that shows that a natural specific immunity can be a racial or even a familial characteristic."

The work of Roberts and his associates may be cited as the best example of success being achieved in the control of a disease by the application of genetics. Roberts and Card (1932 and 1935) found that 65·3 per cent. of the chicks of a strain resistant to *Salmonella pullorum* survived experimental infection with the causative agent, whereas only 27·5 per cent. of the chicks of a susceptible strain survived such inoculation. A difference was observed in the natural resistance to *S. pullorum* of two strains obtained from China. In their later work, employing 128 separate groups of chicks, 71·5 per cent. of those selected for resistance survived large doses of infection, while only 27·44 per cent. of the controls remained well. It has to be mentioned, however, that only one control lot of all those tested showed a high survival rate, and it was believed that this might be the result of using a culture of low virulence. The selected strains were consistent in maintaining resistance through successive generations. Inbred birds resisted the infection better than others. The authors concluded that selection was effective in producing strains of the domestic fowl more resistant to *S. pullorum* than unselected stocks and that this resistance was dominant to susceptibility, as evidenced by mating one with the other, back-crossing and recovering both resistants and susceptibles in the F2 generation. They considered that probably more than one pair of genes was involved. Heredity was therefore considered to be an important factor in resistance and susceptibility to infection with *S. pullorum*.

Roberts and Card also stated that the number of erythrocytes was greater in the resistant than in the susceptible strain. The number of leucocytes was greater in the susceptible strain, while the percentage of neutrophiles was lower in the resistant chicks. The foundation stock for the experiment was obtained from several hundred day-old chicks which were inoculated with *Salmonella pullorum*, and the survivors were used for breeding purposes. Progeny testing was used as a basis of selection, those parents whose offspring had revealed the highest percentage of survival being selected for breeding. The F1 generation produced by crossing resistant and susceptible stock was as resistant as the resistant parents. The progeny of F1 mated to resistant individuals was more resistant than was the progeny of the back-cross to the susceptible. In the F2 generation both resistant and susceptible strains were recovered by selection. When a susceptible male was mated to susceptible females the progeny produced was less resistant than the progeny of a susceptible male and resistant females.

Roberts, Severens and Card (1939) remark that a study of the nature of the hereditary factors involved in resistance to disease (*Salmonella pullorum*) includes a search for the defence mechanism responsible for the difference between the resistant and susceptible individuals. It is stated that the association of bacteria with lymphocytes, and of the latter with resistance are important factors. These authors consider that the difference between the resistant and the susceptible fowls is due to " an inherited differential in the number of lymphocytes at the time of greatest susceptibility to *S. pullorum*," which is stated to be immediately after hatching. The same authors (1939a) discuss the effect of environment on the expression of resistance and susceptibility to disease in the domestic fowl, giving concrete instances to show the adverse effect of unsatisfactory surroundings on an individual following infection with any disease-producing organism.

Hutt (1936) reports that resistance to *S. pullorum* infection shown by White Leghorns does not appear to be associated with a genetic linkage.

Darling (1931) expressed the view that the capacity to resist certain diseases may be possessed by stock which is economically inferior in quality and therefore not profitable for breeding purposes and that resistance or susceptibility may be dependent on multiple factors.

Lambert (1932) and Lambert and Knox (1932), working on fowl typhoid, showed that selection for resistance over four generations decreased the mortality in the selected strains. They concluded that this resistance was inherited and controlled by multiple genes, some of which showed complete or partial dominance. While mortality in the control flocks varied from 85 to 93·2 per cent., the mortality in the selected groups decreased from 39·8 to 9·4 per cent. The results of reciprocal crosses demonstrated that the male as well as the female transmitted resistance to the offspring. Furthermore, it was considered that passive transfer of immunity was not a great factor, if it exists, in the increased resistance of the selected progeny. The strain of fowls resistant to *Salmonella gallinarum* was established by inoculating seven-days'-old chicks with the organism and birds

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were selected for further breeding from families giving the highest percentage of resistance.

Without knowing the etiology of fowl paralysis or the means of its transmission, breeders have shown that by selection they can raise strains of fowls resistant to this disease. Asmundson and Biely (1932) reported results which indicate that resistance to fowl paralysis is inherited.

Dalling (1938) expressed the view that resistance and susceptibility to fowl paralysis might be transmissible by individual birds to the progeny and that the artificial transmission of the disease depended on the susceptibility of the birds used. Fowls bred from the survivors of an outbreak were not necessarily resistant.

Manresa (1932) used rabbits as experimental animals for investigating the inheritance of resistance and susceptibility to infectious abortion. Both kinds of foetuses are carried full term in a genetically resistant mother, but the resistant are born alive, while the susceptible are born dead. In a susceptible mother both types of foetuses are born (aborted) before the full term. It was believed that resistance was dominant but not fixed.

In an attempt to produce a strain of animals all reacting in an identical manner to infection with pathogenic organisms, Irwin (1933) has experimented with a strain of rats descended from one pair, whose ancestors had been inbred for 48 generations, and considers that an ideal strain would be one in which all animals died if infected with a M.L.D., and all survived if infected with any smaller dose.

Irwin and Hughes (1933) considered that an important line of investigation is the question of the specificity or non-specificity of the genetic factors of resistance, since evidence on this point is meagre and conflicting.

Gowen and Schott (1933) tested the rate of survival of two strains of mice to a neurotropic virus and to *S. aertrycke* with results that suggested that the genetic constitution is a composite made up of distinct characters, some of which favour resistance to one environmental agent, others to another. These workers consider that animals resistant to one disease may not be resistant to any other disease.

Webster (1933) discussed the nature of inherited and acquired factors in resistance to infection (*Salmonella enteritidis*) and the results of his work indicated that the inherited resistance can operate against a number of, but not all, harmful agents.

Asmundson (1934) summarised evidence obtained from various publications concerning inherited resistance to disease, and discussed the possibility of genetical differences being involved.

Carpenter and Martin (1939) suggested a genetic approach to the control of adult mortality in the fowl. Representatives of the various breeds, selected on the basis of desirable qualities, were exposed in turn to the important diseases, at the most susceptible age, and the survivors were used for breeding.

Hutt (1939) furnished experimental data on the success of breeding strains of fowls resistant to neoplasms which account for a large proportion of deaths. The success was considered to be the result of breeding, and not due to improved sanitation and environmental conditions. Progeny testing was suggested as effective in establishing such strains. White Leghorns were used in the breeding experiments, and the test period was 500 days. No culling was employed during this period. In two generations of selection, the death-rate among the adult birds in the resistant line showed a significant reduction, while there was a rise in the number of deaths in the line bred for increased susceptibility.

Experiments

Two hens which survived the subcutaneous inoculation of Newcastle-disease virus, and which were therefore presumed to be naturally resistant, were mated to a healthy cockerel in March, 1940. The chicks raised by such breeding were tested for the presence of immunity at three to four weeks after hatching, by one or two subcutaneous injections of fowl passage virus. This virus was represented by a 1 per cent. cell-free saline extract of equal portions liver and spleen derived from a fowl which had died of experimentally produced Newcastle disease. A dose of 1 c.c. of this extract represented one hundred million fowl M.L.Ds.

The experiment was controlled by including an adequate number of chicks hatched from the eggs laid by healthy hens mated to healthy cockerels. The susceptibility of the parents in this case was verified later by inoculation with fowl virus; in all cases the fowls died, suggesting that in these fowls there was no evidence of natural or acquired immunity to Newcastle virus.

Results

During the breeding season five chicks were successfully hatched from the immune pen and kept in a brooder for about a month, and then tested with the virus. As a result of inoculation with fowl virus (Table I) four of these five chicks were shown to be fully resistant to two doses of 50 million M.L.D. Chick No. 11 from the immune pen died from other causes. In all, eleven chicks, representing the progeny of susceptible parents, were used as controls, and all of them died within the usual period following infection by inoculation or by contact. In spite of the small numbers involved, such results, obtained under controlled conditions, appear to suggest that genetical differences are significant in connection with the resistance or susceptibility of fowls to Newcastle disease.

(*For Table I see top of col.* 1, *page* 188.)

DISCUSSION

In the F1 generation the progeny of the immune parent (hen in this case) was shown to be resistant to Newcastle-disease virus. The natural immunity which is revealed by the parent may therefore be inherited by the offspring of either sex. It remains to be determined whether this resistance to the infection is specific and can be carried through subsequent generations, and whether similar results would be obtained by breeding from susceptible hens mated to an immune cockerel. A small number of chicks were hatched from such a cross, however, but they were chilled and died in the brooder house before they could be tested for immunity.

Having regard to the observations of other workers on bacterial diseases, it appears permissible to assume that the gene or genes responsible for the inheritance of resistance to Newcastle disease will probably prove not to be sex-linked. No doubt the genetical interpretation of data involving a simultaneous study of

TABLE I

Showing resistance and susceptibility of chicks to Newcastle Disease virus

Chick No.	Age weeks	Sex	Source	Inoculum	Results and remarks
11	4	Male	Resistant hens	50 million M.L.D. fowl passage virus	Died 2nd day other causes
12	4	Female	" "	Do., and a similar dose on the 10th day	Remained well
13	4	Male	" "	" "	" "
14	4	Female	" "	" "	" "
16	3	"	" "	" "	" "
1	1	Male	Susceptible hens	20 million M.L.D. fowl passage virus	Died 3rd day, Newcastle disease
2	1	"	" "	" "	" "
3	1	"	" "	" "	" "
5	4	Female	" "	" "	" "
6	4	Male	" "	50 million M.L.D. fowl passage virus	Died 2nd day, Newcastle disease
7	4	Female	" "	" "	" 3rd day " "
9	2	"	" "	" "	" 5th day " "
10	3	Male	" "	" "	" 2nd day " "
15	1	"	" "	" "	" 3rd day " "
4	1	Female	" "	Contact infection	" 5th day " "
8	4	"	" "	" "	" 7th day " "

Note.—The cause of death in the case of the other chicks from the susceptible hens was confirmed as Newcastle disease by the inoculation of the developing chicken embryo.

immunity is difficult. The resistance to infection exhibited by the offspring of resistant hens has been shown to have no sex-linked basis, because amongst these chicks there were both males and females. A reciprocal cross may not clarify the position, but mating the F1 generation together might possibly provide an F2 distribution which would furnish information concerning autosomal inheritance of the factors in question. If resistance to a specific disease is inherited, it is more likely to be due to multiple autosomal factors.

One would expect to find fowls which are either naturally resistant or susceptible, but it may be possible to immunise the latter artificially. Whilst there may be resistance shown by the progeny of the naturally resistant hen, it is believed that all the progeny of the susceptible hen, but immunised experimentally, will be susceptible in the F1 and in the subsequent generations. In a breeding programme of this nature one has to select fowls which resist authentic infection. Owing to the rapidity with which the avian family reproduces, it seems possible that a large number of resistant fowls might be raised within a short period and distributed to different places for breeding resistant strains.

The genetical work presented in this paper appears to suggest that breeding fowls resistant to the disease may prove a useful line of research. It is regretted that the number of chicks used in these experiments, due to factors outside our control, is not large enough to permit definite conclusions, but the observations submitted appear to be a hopeful line of investigation to those who are engaged on a similar problem.

Summary

The chicks hatched from the eggs laid by two hens naturally resistant to Newcastle-disease virus, and mated to a susceptible cockerel, were shown to be resistant to experimental infection by subcutaneous inoculation with a fowl-passaged virus which in all cases killed the controls. It is probable that resistance to Newcastle disease may be inherited by the offspring in a genetical manner, and that one of the means of control of this disease may therefore be accomplished by breeding.

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Warwickshire County Council has decided that an initial inspection shall be made of each riding establishment by a veterinary surgeon, to ensure that horses shall be ridden only when in a fit condition.

THE VETERINARY RECORD

March 29th, 1941.

OUR CLINICAL SECTION

THERE is no more gladdening sight for the Editorial Committee of this journal than an abundant supply of clinical articles. That the flow of these might well have been checked by current calamities and difficulties was to be expected. That expectation has not been fulfilled, for not only is the quantity on the upgrade, but the quality of the material forwarded has been, if anything, of enhanced quality of late. The operation for torticollis described by Mr. R. G. Smith in this issue and the successful Caesarian operation on a cow recently recounted by Mr. C. D. James are examples that go to show that our general practitioners are, despite the great difficulties encountered in practice since the war began, still pursuing a vigorous and enterprising course.

Just now, when State-aided preventive medicine is being so forcibly and ably presented to interested bodies as a vital means whereby the abilities of veterinarians could be far more used than at present for the well-being of the flocks and herds of our country, it is well to realise that the treatment and cure of disease already established, offers, and will continue to offer in increasing measure, an outlet for energetic and pioneer-minded practitioners. There is growing evidence that the young graduate of to-day is, on the average, entering general practice far better equipped in surgical procedure than heretofore, whatever may be the degree of his alleged inferiority to his forbears in the matter of pre-graduate clinical experience.

It has been whispered in more than one quarter that the *Record* is tending to become too much a repository of the researches of workers in fields not as directly connected as they should be with veterinary practice. It is true that this journal has become increasingly sought after in the last few years by workers in allied branches of research. This we take to ourselves as a compliment to our efforts to maintain a high standard of professional journalism. On the other hand, until quite recently it has been a source of anxiety to the Editorial Committee that the practitioners were, on the whole, unwilling or unable to contribute their fair share of material to our columns. There are indications that this editorial "grouse" will no longer be justified by the facts. We sincerely hope it may continue to be so.

Lord Woolton's speech in the House of Lords lifted quite a substantial corner of the veil shrouding official food policy. But there are still many important aspects which require further elucidation. It is now quite evident that the Government, actuated by stern necessity, desires to convert us from a nation of heavy meat eaters to something approaching vegetarians.—*Financial News.*

CLINICAL COMMUNICATION

Operation for Torticollis
(Congenital Wry-neck)

R. G. SMITH, M.R.C.V.S.
Kilmarnock

Subject.—Ayrshire heifer calf, eleven months old.

History.—Over a period of six months the head of this calf had been gradually pulled over towards the left elbow.

Examination.—When loose, the calf walked in left-hand circles and, if hurried, would lose balance, tending to fall. The head was pulled so far round to the left that the animal could neither straighten the neck nor raise the head of its own accord, but manually head and neck could be straightened by lifting the head and applying pressure on the outside arc of the semi-circular bulge in the neck. Emaciation was noted, evidently due to impaired nutrition as a result of interference with "cudding."

Operation.—The neck was clipped on the left side, and the animal anaesthetised with 1 oz. chloroform. The neck was straightened over a sack of straw, and held in position. A 3-inch skin incision was made 1 inch from the jugular vein and parallel to it midway between the angle of the jaw and base of the first rib. Both ends of this incision were extended across the lateral surface of the neck, forming a U-shaped incision, the arms of the U being 5 inches long and parallel to the spine of the scapula in its normal position.

The enclosed piece of skin was reflected, exposing the two portions of the brachiocephalicus (cleido-mastoideus and cleido-occipitalis), the omo-transversarius and lower part of the trapezius. By blunt dissection the two portions of the brachiocephalicus and the omo-transversarius were each split longitudinally for 3 inches and severing of each was completed as in Diagram 1.

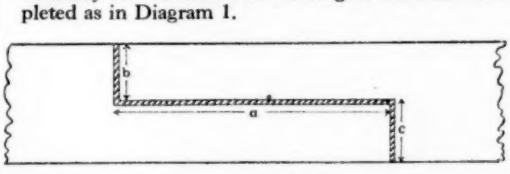

Diagram 1

(a) 3-inch longitudinal incision parallel to muscle fibres (blunt dissection).
(b) Primary cross incision through muscle fibres.
(c) Secondary cross incision through muscle fibres, completing the division of the muscle.

On severing the c-mastoideus portion of the brachiocephalicus, the spinal accessory nerve was exposed, and in severing the c-occipitalis portion the initial skin incision had to be extended over the jugular, as the muscle and vein are in close relationship here, and the jugular was left partially exposed. The severed muscle fibres at "b" were sutured with those at "c" in each case, as illustrated in Diagram 2 (*over-leaf*), in the hope that regeneration would occur, giving the animal use of the muscles involved.

The flap of skin being replaced, it was lightly sutured and left unbandaged. Bleeding was negligible.

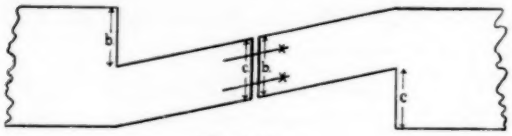

Diagram 2.

After-treatment.—On recovering from the anaesthetic, the calf was able to turn the head completely to the right of its own accord. A reversed halter was put on the calf, and this was tied for three days to a stirrup leather used as an overgirth, the length of shank of the halter being adjusted so as to keep the head slightly to right of headline. The wound was left undressed for seven days and sloughing of about three inches of skin in the base of the U took place, healing here being by third intention.

Observations.—Phlebitis of the jugular vein and damage to the spinal accessory nerve must be contended with, and are the chief dangers in this operation. Diagrammatically, the method of severing and suturing the muscles leaves little to be desired. Practically, it is almost impossible to obtain perfect apposition between the cut ends, and the movement of the neck muscles in feeding decreases the chance of complete union between severed muscle fibres.

Recovery was, however, uneventful, the animal now having free and full control over head and neck movements.

H.M. STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. **Copies can be purchased through any bookseller, or directly from H.M. Stationery Office, at Hotel Lindum, St. Anne's, Lytham St. Anne's, Lancs.**

	Price net s. d.	*Post free* s. d.
Command Papers (Session 1940-41):		
6257. Agricultural Research Council. Accounts showing the receipts and payments in 1939-40; together with the Report of the Comptroller and Auditor General thereon	0 1	0 2
Medical Research Council:		
War Memorandum 3. Economy in the Use of Drugs in War-time, with an Appendix giving a list of Drugs of which production within the British Empire should be encouraged. (45-9-3)	0 3	0 4
Statutory Rules and Orders, 1941:		
269. Feeding-stuffs (Rationing) Order, 1941. General Licence and Directions, February 28, 1941	0 1	0 2
270. Compound and Mixed Feeding-stuffs (Control) (No. 2) Order, 1940. Amendment Order, February 28th, 1941	0 1	0 2
312. Foot-and-Mouth Disease (Disinfection of Road Vehicles) Order, February 22, 1941	0 1	0 2

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Weekly Wisdom

There is a growing tendency on the part of a few . . . to disfigure the essential beauty and simplicity of our art by adventitious details that confuse and frighten . . . in the roll call of Time it shall not be forgiven them.—Markowitz: "Text-book of Experimental Surgery."

ABSTRACTS

[STUDIES OF THE PHYSICO-CHEMICAL STATE OF THE CALCIUM IN THE SERUM OF THE RUMINANT. Ray, S. C. (1939.) *Biochem. J.* **33**. 1599-1605. (1 fig., 3 tables, 13 refs.).]

It is generally agreed that the calcium (Ca) of serum may be divided primarily into ultrafilterable and non-filterable fractions, but there is as yet no consensus of opinion as to the manner in which these fractions may be further subdivided. In the present studies, the changes occurring in the partition of serum Ca were determined in four sheep transferred from a phosphorus (P)-deficient to a normal diet, and in sheep, goats and cows subjected to starvation.

The addition of phosphate to the ration of previously P-deficient sheep led to a rapid rise of serum inorganic P, which soon attained normal levels. The total serum Ca varied inversely as the inorganic P, but it was found that its changes were due almost entirely to alterations in ionised Ca and in protein-bound Ca, which, on the basis of previous experiments, are believed to exist in equilibrium with one another. The true protein level of the serum was little affected.

Fasting brought about an increase in serum inorganic P, and a corresponding decrease in total serum Ca. Again, the alteration in total Ca was due to a fall in the ionised and protein-bound fractions. Increases in serum true protein occurred in all cases.

The results obtained in the present work are considered as further disproving the reliability of the constant K, in the McLean-Hastings mass-law equation which relates serum Ca to serum protein:—

$$\frac{[Ca^{++}]\ [Prot.^{++}]}{[C\ \text{proteinate}]} = K$$

A. N. W.

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[COCCIDIOIDAL INFECTION IN A DOG. Farness, O. J. (1940.) *J. Amer. vet. med. Ass.* **97**. 263-4.]

Coccidioides immitis infection is known to occur spontaneously in man, cattle and sheep. The author says that he now has the privilege of adding the dog to this list. Reproductions of two photographs, one of Coccidioides spherules in the lung of the dog, showing the ascopores, and the other of a Coccidioides spherule in a "tubercle-like nodule" illustrate his brief summary of the main facts that are known about this organism.

The parasitic form is found in infected tissue, the vegetative form in culture and presumably in nature. In infected tissue and sputum the organism appears as a spherule, 5-60 microns in diameter, with a highly refractive double contour. This spherule form is apparently not transmissible, man to man or animal to man infection being unknown. On suitable media it forms long mycelia which bear chlamydospores easily carried in the air and it is believed that hosts are infected from the soil, usually by way of the respiratory passages, unless infection occurs through the broken skin.

In man the disease begins acutely with fever, cough and sputum. When the lungs are X-rayed, they show scattered densities easily mistaken for pneumonia or tuberculosis. The lymph nodes at the root of the lung are always enlarged. Recovery is common, but a

secondary chronic stage may follow which has a mortality rate of over 50 per cent. No age is immune. Diagnosis is only by recognition of the characteristic spherules and confirmation by inoculation of guinea-pigs and culture of the spherules. In man intracutaneous injection of coccidioidin, a broth filtrate of a Coccidioides culture (available on request from Charles E. Smith, of the Stanford University School of Medicine, who prepared it) produces a characteristic skin reaction, at its height within 48 hours, showing erythema, induration and in some instances vesiculation of the central zone of oedema. It very closely resembles the tuberculin reaction. The dog studied was a Great Dane bitch, which had suffered from no known illness other than rickets. All her litter mates had suffered also from this. She had always had difficulty in using her hind legs, and this disability became so marked that she was destroyed at the age of about two years. Multiple small nodules, some of them necrotic, were found scattered through both lungs. Nodules were also found in the liver, spleen and kidneys. Grossly, the lesions resembled tuberculosis, but sections showed numerous Coccidioides spherules, but no tubercle bacilli.

The author comments that, in man, coccidioidal meningitis is not uncommon and that coccidioidal abscesses of the brain are known. The brain and spinal cord of this Great Dane were not examined, but he suggests that the leg weakness shown by this dog may have been connected with the Coccidioides infection. G. L.

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[NEPHRITIS AND ITS INFLUENCE UPON HAEMOGLOBIN PRODUCTION IN EXPERIMENTAL ANAEMIA. Whipple, E. H., and Robscheit-Robbins, F. S. (1939.) *J. Exp. Med.* **69**. 485-498. (7 tables, 4 refs.).]

Persistent anaemia is frequently observed in human cases of glomerulonephritis. In order to study the relationship, observations of nephritis were made in dogs in an anaemic colony. The dogs were maintained under uniform conditions, protected against distemper and other infections, and fed on a standard balanced diet. The dogs were bled each week to ensure a constant anaemia level. At autopsy over 11 per cent. of the dogs were found to suffer from glomerulonephritis. In these animals during the last one to two months non-protein nitrogen was high, and the condition verged on uraemia. In some cases the haemoglobin production fell to zero, in others it was only slightly impaired. Several cases are cited to show that endometritis or sterile abscesses will cause almost complete inhibition of haemoglobin production in the standard anaemic dog. Whether renal injury or some obscure inflammatory focus is responsible for the anaemia associated with chronic nephritis has not been determined. In these experimental dogs endocarditis was frequently found in association with the nephritis, and cases often terminated in bronchopneumonia.

The glomerulonephritis described by the authors begins insidiously with albumin, casts, and a few erythrocytes in the urine. No obvious symptoms are then presented over a period of years, but at intervals there is recurrent anorexia, with or without vomiting. Gradually the non-protein nitrogen of the blood increases, casts become more numerous, and renal elimination is decreased. Acute nephritis may be superimposed and form the terminal phase, but this is not usual. On autopsy the kidneys show scarring of their surface, deletion of the cortical striations, and narrowing of the cortex. The glomeruli frequently exhibit adhesions between the capsule and glomerular tuft and may show signs of degeneration. The nephritis appears to cause little or no change in haemoglobin production in the early stages of the disease. Later, however, moderate changes usually occur. The average in advanced cases is about 70 per cent. of normal haemoglobin production. It seems unlikely that this degree of impairment would result in spontaneous anaemia in the dog. D. D. O.

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[STUDIES OF THE SECRETION OF MILK FAT. III.—THE EFFECT OF THYROXINE ADMINISTRATION ON THE BLOOD LIPOIDS AND ON THE NATURE OF THE MILK FAT. Smith, J. A. B., and Dastur, N. N. (1940.) *Biochem. J.* **34**. 1093-1107. (6 figs., 7 tables, 14 refs.).]

Studies were made of the lipoid constituents of the blood and milk of four cows which were injected intramuscularly with a neutralised solution of thyroxine sodium B.P. In three cases, all treated over a 10-day period during the autumn months, the animals were between the 27th and 37th week of lactation, and were given the equivalent of 10 mg. thyroxine per day. A fourth cow, which had been in milk for 15 weeks, was similarly treated over a 15-day period in summer. Parallel studies were made on normal animals under the same conditions and at approximately the same stages of lactation.

As had been shown by other workers, the milk yield was markedly increased during, and for a short time after, the period of hormone treatment, and there was also a large increase in the secretion of milk fat. The actual nature of the milk fat remained essentially unaltered. In the blood plasma, the main lipoid constituents were decreased by some 10 to 20 per cent., and at the same time there was an increase of about the same order in the concentration of the blood sugar. A. N. W.

FOOD OF FUR ANIMALS IN CAPTIVITY

"Practically the only animals that are now being bred commercially for their fur are silver-foxes, minks and rabbits. Others have been tried, but costs of feeding, overhead charges generally, and difficulties of inducing breeding in captivity made the price of the skins greater than that of equally good wild-caught examples, so that the undertakings came to an end. To some extent, the first needs in this relatively new industry were the testing of equipment, the perfection of methods of management, and the control of diseases and parasitic infestations. These problems have been tackled, but until recently no attempt had been made to discover by controlled experimental work the diets most suitable as regards results and costs for the carnivorous animals recently taken from the wild. The Yearbook of Agriculture for 1939 of the U.S. Department of Agriculture contained an article by Charles E. Kellogg on 'Nutrition of Fur Animals,' which has been reprinted as Yearbook Separate No. 1717 (U.S. Govt. Printing Office, 1940). It contains in 22 pages a summary of the scientific work carried out at the four or five experimental stations in the United States where nutritional research with fur animals has been carried out. It is impossible to indicate the findings here; but they should be of value to breeders of fur animals in this country, whenever circumstances permit again the development of the fur-farming industry."—*Nature.*

REPORT

[DAIRY HERD TESTING IN NEW ZEALAND. Report on Work carried out under the Herd Improvement Plan, 1939-1940.]

The main purpose of the Herd Improvement Plan is to improve and co-ordinate recording work and to obtain information regarding milk production which may provide a basis for research and investigation.

The work is now carried on by six Associations covering the whole Dominion, having special consulting officers attached who advise on problems of breeding, nutrition and disease.

In the large number of tables which follow the introduction to the report some interesting facts emerge. The first group deals with milk production records, more especially the fat percentages and the duration of lactations. In the second group an attempt is made to assess the relative efficacy of various sires on the basis of the milk production records of their daughters. The argument that sire survey work loses a great deal of its value because of the difficulty of retaining bulls to an age when they can be proved (about 5 years) is largely disproved by this report. The wastage in this group was estimated at 20 per cent., the " danger of in-breeding " accounting for 14·8 per cent. of all bulls sold or removed. The value of " bull circles " in reducing this loss is emphasised. 10·1 per cent. were culled because of sterility or because they had failed to stock cows repeatedly, a similar number for fence breaking and bad temper and 10·9 per cent. of the total losses were due to accident.

The figures relating to the wastage in the cow population due to disease are as follows, given as a percentage of the total number of cows being recorded :—

Mastitis	3·71
Sterility and Abortion	2·79
Tuberculosis	0·33
Calving troubles	0·15
Milk Fever, Grass Staggers and Paralysis	0·17
Bloat	0·42

the total being made up to 17·12 per cent. by sundry other diseases, accident and losses through unknown causes. The figures for the first three diseases are somewhat different from those relating to this country and the absence of any losses from Johne's disease is significant. The figures relating to mastitis and sterility show, as one would expect, an increase in the incidence of these conditions with advancing age. In the former 1 per cent. of cases occurred in the 2-year-old group and increased steadily to 8·2 per cent. in cows of 12 years and over. The figures for sterility show a rise of from 2·1 per cent. to 7·4 per cent. in those over 10 years old. Though the total wastage due to disease is greatest in those herds showing the highest production rates, the incidence of mastitis is highest in low yielding herds. (It may be that the mastitis is actually responsible for this low yield.)

Much other interesting information is presented and the publication itself would justify careful examination by those concerned in such matters as are dealt with.

N. S. B.

IN PARLIAMENT

The following are among the questions and answers recently recorded in the House of Commons:—

Horse Breeding

Colonel Carver asked the Minister of Agriculture what was the number of stallions licensed last year under the Horse Breeding Act, 1918, dividing the number, respectively, for heavy horses, light horses, cobs and ponies?

Mr. Hudson: 1,479 heavy horses, 166 light horses and 49 cobs and ponies were licensed uider the Horse Breeding Act, 1918, to travel for service in the 1940 season.

Colonel Carver asked the Minister of Agriculture (1) whether he can give an assurance that everything possible is being done at the present time to encourage the production of heavy agricultural horses, with a view to ensuring a steady supply of horse-transport for agricultural operations, which are likely continually to increase in this country over the next decade;

(2) whether he has considered the representations of the National Farmers' Union that the grants to heavy horse societies should be reintroduced at an early date; and whether, in view of the decline in horse-breeding which has occurred since the withdrawal of this grant, he will reconsider this matter as one of urgency?

Mr. Hudson: No financial assistance is at present being given for heavy horse breeding. I have considered the representations of the National Farmers' Union with regard to the restoration of the grants to heavy horse societies, but I regret that I cannot see my way to rescind their suspension. I am aware that there has been a decline in horse breeding over the last two years, but the evidence available does not suggest that this decline is attributable except in a minor degree to the withdrawal of the grant. Seeing that breeding at the present juncture is not likely to affect the supply of horses during the war, I cannot agree that the matter is one of urgency. Equally the view that the demand for agricultural horses is likely to increase over the next decade is, to say the least, a matter of opinion.

REACTIONS OF MIRACIDIA OF SHEEP LIVER-FLUKE

In the course of experiments testing some reactions of the ova and miracidia of *Fasciola hepatica*, Henry J. Griffiths exposed many representatives of eleven species of Canadian molluscs to miracidia (*Canadian J. Research*, 17, 205; 1939). Individual molluscs were exposed and kept under observation during exposure, being killed later and examined for stages of the parasite. These examinations, as well as attempted mass infections in 25 tanks of snails, yielded no evidence that any of the species harboured the liver-fluke. Yet on exposure to miracidia all the species were attacked, those belonging to non-Lymnaea groups almost as readily as the Lymnaea types themselves; but the parasite, which attached itself to any exposed portion and might remain attached for 10 minutes endeavouring to penetrate the host's tissue, ultimately dropped off. Although the attacks were deliberate in many cases, in others they were accidental, and miracidia were often seen swimming close to the snails, and even to a known vector *Gyraulus ferruginea*, without showing any sign of attraction or of attempt at attachment. This is in agreement with the conclusions of Mathes, that although miracidia avoid hard bodies such as stones, they show no sign of chemotaxis in finding the intermediate host.—*Nature* (October 5th, 1940).

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The end of the month sees the Red Cross Agriculture Fund approach the £500,000 mark. Contributions to this sum have been received from sources representing fully a 100 different phases of the industry.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Mar. 31st.—Meeting of the N.V.M.A.—R.C.V.S. Joint Survey Committee at 36, Gordon Square, W.C.1, 11.30 a.m.

April 1st.—Meeting of the Finance and General Purposes Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 11.30 a.m. **Meeting of Council, N.V.M.A.,** at the Connaught Rooms, Great Queen Street, Kingsway, 2 p.m.

April 2nd.—Special Meeting of the Derbyshire Division, N.V.M.A., at Nottingham, 2 p.m.

April 3rd.—Meeting of the Central Veterinary Society (Division, N.V.M.A.), at the Conway Hall, Red Lion Square, W.C.1, 2.30 p.m.

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SUPPLY OF "THE VETERINARY RECORD" TO STUDENTS

As announced in our issue of last week, this journal is now available to all veterinary students at a reduced charge—a concession hitherto restricted to those who have passed their third professional examination. The fee for new student subscribers is £1 5s. 0d. per annum.

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PERSONAL

Will.—Sir John M'Fadyean, M.B., F.R.C.V.S., of Highlands House, Leatherhead, Surrey, formerly Principal of the Royal Veterinary College, London, left estate of the gross value of £61,286 (net personalty £54,601), all of which goes to his children.

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R.C.V.S. OBITUARY

Franklin, Benjamin, Chesfield, nr. Hitchin, Herts. Graduated London, December 14th, 1894. Died March 11th, 1941; aged 68 years.

Mr. Benjamin Franklin, M.R.C.V.S.

A "Chrysanthemum King"

Mr. Benjamin Franklin, M.R.C.V.S., though starting in life as a veterinary surgeon and practising his profession in the Hitchin and Stevenage district, had farmed for many years and also pursued as his main interest the cultivation of choice chrysanthemums, achieving a national reputation as an amateur grower.

In this connection, the *Hertfordshire Express* says of him: "He grew some of the most glorious Japanese blooms, and these gained him high awards at the London shows of the National Chrysanthemum Society in the amateur section. At these shows he was chosen as a judge in the open classes. He was a member of the Committee of the Hitchin Chrysanthemum Society, and for many years won the cup for the best bloom in the show. He won it outright several times, but re-presented it to the Society, only to win it again at the next show. Many of the professional growers had such a healthy respect for Mr. Franklin's exhibits that they would not show against him, and there was always an admiring crowd around the great blooms he used to show."

The tribute proceeds: "A keen sportsman, Mr. Franklin gave yeoman service to the Stevenage Cricket Club, and in his younger days played for his County. For 35 years he was Treasurer of the Stevenage Cricket Club, and in July last year his services were recognised by the presentation of a silver salver when he retired from that office, and it was typical of him that, in acknowledging the gift, he should say, 'If you had given me nothing I should have been satisfied, for all I have done has been for the love of cricket.' A man of simple tastes, Mr. Franklin made many friends by his genuine nature, and his loss will be felt among a wide circle."

Mr. Franklin had been associated with the Stevenage Bunyan Baptist Church since its inception, and it was there that the funeral service took place on March 15th.

In 1914 Mr. Franklin married the third daughter of the late Mr. James Wright, and there is no family, but with Mrs. Franklin and Mr. W. E. Franklin, his brother, much sympathy has been expressed.

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NATIONAL A.R.P. FOR ANIMALS COMMITTEE

Veterinary surgeons who are assisting N.A.R.P.A.C., and who are within easy reach of Holborn, are informed that an anti-gas course has been arranged by the Metropolitan Borough of Holborn to commence on Thursday, April 3rd next, and will be held at the National Hospital, Queen Square, W.C.1. Subsequently, lectures will be given on Tuesdays and Thursdays and the time of commencement of each lecture is 6.15 p.m. The course is under the direction of their Chief Instructor, Mr. L. Weatheritt, A.R.P.S.

Those wishing to attend should send word to the Chief Executive Officer, and should go along to the first lecture.

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FARMERS WARNED TO CULL THEIR HERDS AND FLOCKS

Mr. R. S. Hudson, Minister of Agriculture and Fisheries, addressing a mass meeting of farmers and farm workers at Leicester on March 19th, again spoke in grave terms of the feeding-stuffs position. He said that the Government had been reviewing the total supplies of feed of all kinds, including grazing, that were likely to be available during the next twelve months. It was quite clear that if we were to get the best value in milk and meat from the reduced supplies of feeding material, an appreciable reduction in our present numbers of stock was essential. He recognised that it was important that whatever reductions were needed should be affected gradually over the next six months, and it was for that reason that he wanted to give farmers ample warning, so that they could begin at once to look round their flocks and herds and select the best to keep and the worst that must go.

Referring to dairy stock, the Minister emphasised that the Government wanted to maintain the existing volume of liquid milk as far as possible, and also wanted to increase the cheese output. This did not mean, however, that the dairy herd was not to make its contribution to lessening the call on our total stock feeding resources. There were still many poor-yielding cows which could be eliminated, and these should be culled during the next few months and offered to the Ministry of Food for slaughter. Mr. Hudson pointed out that dairy farmers could no longer count upon the arrival of sufficient rations to keep up their milk supply while they jogged along in the same old comfortable way. He warned them that they must adjust themselves to present conditions and grow much more of their own feeding-stuffs than before.

As for beef cattle, the Minister said that reduction in numbers would occur in two ways. There would have to be a smaller intake and a more rapid slaughter. Foot-and-mouth disease in Eire was already causing the first steps in reduction of intake, the scourge there having reached a stage that makes the import of Irish stores impossible for some time to come; and even when Eire became free again, we should have to restrict severely imports of stores from that country. The necessary measures for ensuring adequate reductions in the numbers of home-bred animals were being worked out in consultation with the producers. Many beasts would have to go to the butcher leaner, less finished and without the usual bloom. Farmers should not wait until the end of the summer, when their cattle would be fully fat, and thus

cause a glut in the autumn; a good proportion of them should be brought out at a less mature stage in the summer when prices would be at or near their peak.

With regard to sheep, the Minister made it clear that although ploughing up had undoubtedly meant, and would continue to mean, the cutting down of grass flocks, the Government wish to maintain hill sheep and arable sheep.

Despite his warning as to the necessity for cutting down the numbers of cattle and sheep, the Minister expressed the hope that no one would run off with the idea that this was a panic policy of slaughter at any cost, and pointed out that far from this being the case, this autumn, even after the contemplated reduction in numbers, the country's cattle population would be well in advance of the lowest point it touched in years after the last war.

As for pigs and poultry, both these classes of stock were competitors of humans for their food, and when that competition became acute, as it was now, it was obviously pigs and poultry that must go short. This again did not mean the end of all pigs and poultry, as there would remain considerable quantities of swill and waste foods to supplement rations.

Farming Comment

In connection with the above, *The Farmers' Weekly* observes: "There is much that we want to know before we can plan the culling of our flocks and herds. On what basis are dairy herds to be reduced? Is there to be a national reduction scheme directed by the Ministry through the county committees? Will reduction take account of breeds?

"Will it be based on the total gross yields of the herd—that is, on the average yield per head of the herd—or on the individual yields of each cow?

"Is the reduction to be a percentage cut of every herd in the country, or is the man with a herd of high-yielders to keep the lot, and the man with a low yielding herd to lose all?

"Is the reduction to be officially enforced and directed, or is it to be left to each farmer?

"Comparison between herds would indeed be odious if that were the basis. The man running a herd of thrifty Shorthorns with a bail dairy on thin land is obviously producing much less milk per cow than the man with a herd of Friesians lying in during winter, and getting as much cake as possible. It would be wrong if the bail dairy man were penalised by reduction, for his herd is probably producing milk as economically as the other.

"These and many other details have to be provided before farmers can act upon the advice Mr. Hudson has given."

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MINISTRY OF AGRICULTURE NEWS SERVICE

Roots Mean More Milk and Meat

Experiments that prove value of Succulents for Winter Feed.—Thanks to science, the farmers of Britain are now able to aid their country by growing more food in a shorter time than it took to increase the output of the land in the last war. But there are also aspects of farming where the countryman's instinct may be a more reliable guide than statistics amassed in the laboratory. All agree that root crops produce more food per acre than any other crop, but their bulk and cost in relation to purchased feeding-stuffs was rather violently questioned by those who produced figures to show that nine-tenths of roots were water. To which the farmer's reply was: "Yes, but where else can you find such water?"

The farmers have right on their side. Feeding experiments have shown that cattle receiving winter succulents, such as swedes, mangolds and kale, make better use of their food than those receiving none, and produce more milk or meat from a given weight of food. Perhaps it is because the water really is rather special water. The following was the result of some experiments made in East Sussex, where the average yield of over 2,000 herds receiving roots was compared with the yields of 223 receiving none. Those receiving no roots were getting more concentrates. The average daily yield in the no-root herds was 20·3 lb. per cow compared with 22·5 lb. in the herds where roots were fed. In other words, the cows receiving roots gave 10·8 per cent. more milk, although they got no more food than the others. Experiments on two farms near Cambridge confirmed these figures.

Very careful experiments carried out in Scotland showed an advantage of 25 per cent. in favour of roots in the case of meat production. The bullocks on the no-roots ration had not the bloom of the others, their skins were drier, they were not so well filled out and they had not the sappy appearance of those that were given roots.

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Improving Common Grazing

New Forest as a Reservoir of Dairy Stock.—In many parts of England there are common grazings that leave much to be desired. It is often rather difficult to get common action agreed upon to lay out money for their improvement, for there is apt to be a minority who are content with things as they are. But the present time creates a unique opportunity for co-operation between County Committees and those who enjoy common rights.

The New Forest, where many have the right to turn animals out for forest grazing, is an example of this. The open grazing spaces, known in the Forest as "lawns," have become overgrown with brambles and scrub and the grazing has deteriorated. They are not suitable for ploughing up and growing arable crops, but they could very well be ploughed and re-seeded and so become very much better pasture. There is also the likelihood that dairy heifers will be in demand a year or two hence, but at the present moment the diminished acreage of grass on dairy farms cannot well be spared for rearing them.

It is estimated that, if the "lawns" were improved, they could deal with about 10,000 young heifers yearly. There might well be an opportunity here for New Forest farmers and their County Committees to co-operate. It would bring three advantages. An improvement in the amenities of the Forest; greatly improved grazing for the commoners; and a useful reservoir of young dairy stock that made no demand upon dairy pasture in normal use.

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Rabbits must be Exterminated

Some people have been a little shocked that we should have been gassing rabbits at a time when meat is not plentiful. Gassing, however, is generally used to follow up the normal methods of shooting, trapping, snaring and netting, which, if done thoroughly, convert the majority of the rabbits into human food. But it is not economical, nor in the interests of the country, to produce rabbit meat for human food by feeding the rabbits on growing crops. They are a pest. The damage they do is out of all proportion to their value as food, even in war-time. In any case, rabbit meat is only one part of our food supply, whereas the crops they feed upon can be used to meet a variety of the needs of the community. Therefore, it is the duty of all landowners and farmers to take every possible step to deal with a plague that threatens serious loss of essential food supplies. The rabbit must be exterminated, and those not shot or caught must be dealt with by the gassing method. This form of attack is particularly desirable during the breeding season where conditions are favourable for its use.

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The time to gas the rabbits is before the rush of spring work begins and before they do too much damage to young crops and grass. Shooting, ferreting and trapping are useful methods of attack and should first be used. For they have the advantage of adding a little to the farm's income and providing some extra meat for the nation. But no one would say that these methods could completely clear a warren. It is no more economic to keep some rabbits on the farm for the few shillings they bring in than to put a pike or two among the trout because

fishmongers sometimes buy pike. And during the breeding season rabbits are little wanted for human consumption.

Gassing rabbits is simple, safe and cheap. Seven pounds of Cymag or Cyanogas are sufficient to treat 80 to 100 rabbit holes. From March 1st to August 31st, 1941, the Ministry of Agriculture have made arrangements for farmers to obtain Cymag and Cyanogas at half the current retail price, provided the County War Agricultural Executive Committee certifies that it is required for the destruction of rabbits. The full retail price of Cymag is now 18s. 0d. per 7 lb. tin. Cyanogas cost 15s. 0d. per 5 lb. tin. The powder is spooned into the burrows by a shallow tin box, large enough to take a tablespoonful of powder, nailed or tied to a stick about 3 feet long. This is the ladle. Filled with powder, it is pushed into the burrow as far as possible and tipped over. When the powder thus makes contact with the moist earth, it gives off a highly poisonous gas. The entrance is then closed by a turf, that should be firmly trampled down to prevent any gas escaping. Every hole should be treated in the same way, and to finish the job off properly all treated burrows should be visited again within 24 hours so that any found open can be treated again.

There is no danger to the operator provided he keeps to the windward side, but if anyone should happen to get a whiff of gas, a sniff of ammonia is a perfect antidote.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

Correspondents submitting letters for anonymous insertion must forward their names and addresses for the information of the Editor; otherwise their communications will not receive consideration.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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PRACTICAL TRAINING FOR VETERINARY STUDENTS

An Appeal to the Profession

To the Editor of the Veterinary Record

Sir,—At a recent meeting of the Council of the Royal College of Veterinary Surgeons a communication was received from the President and Secretary of one of the Student Associations pointing out the difficulties which students experience in satisfying the requirements of the College with regard to practical training. These requirements are set out in a by-law which provides as follows:—

> "Before presenting himself for the final examination each candidate must produce a certificate or certificates from one or more members of a panel of extra-mural teachers approved by the authorities of the school he has attended showing that subsequent to passing the first examination he has
>
> (*a*) satisfactorily attended cases of disease and/or accident and has had experience in general practice among the larger farm animals for a period of not less than six months;
>
> (*b*) attended six cases of parturition in the larger farm animals.
>
> Each candidate will be required to keep records of cases seen during the aforesaid period of six months, and to produce case-books attested by the extra-mural teacher to the authorities of his college and to the examiners of the Royal College of Veterinary Surgeons if and when required to do so."

Every general practitioner will agree that students who have satisfied these requirements, limited though they are, should in consequence be better equipped for general practice. But the students complain that many of them find it impossible to fulfil the requirements. They have written to a large number of practitioners asking for facilities to be afforded them during the College vacations for accompanying the veterinary surgeon on his visits to farms, but have met with no response. It is true that the Principals of the Veterinary Colleges have compiled panels of practitioners who have expressed their willingness to receive pupils and give them opportunities for seeing practice, but the number of practitioners on these panels is totally inadequate for the number of students involved.

It is of the utmost importance that opportunities should be available to all veterinary students to become acquainted with farm veterinary practice. Members of the profession are often heard to complain that very few of the new graduates who come to them in the capacity of assistants have had satisfactory practical training in connection with the diseases of farm animals. It was in the hope that practitioners would be willing to co-operate with the veterinary schools in providing students with the necessary facilities that the Council drafted the by-law quoted above, but unless a sufficient number of practitioners are willing to assist in the scheme, it cannot, of course, succeed. It is to the practitioner and not to the veterinary colleges that the student must look for opportunities for seeing ordinary everyday practice among farm animals.

The Council, therefore, makes an urgent appeal to all practitioners who have not yet seen their way to help, to join the panel of those to whom veterinary students may go for the purpose of acquiring that practical experience which will be so valuable when they have obtained their diploma.

If any member of the profession has hitherto refrained from helping in this work on account of some special objections, may I ask him to write in confidence to me, explaining what his objections are. The Council of the R.C.V.S. has appointed a special committee to consider the whole problem, and it would help the Committee in their deliberations if they were made acquainted with the difficulties which have prevented a practitioner from assisting in the scheme. The Committee consists solely of practitioners, and those responding to the appeal will realise that their point of view will be sympathetically considered. It will be the endeavour of the Committee to draw up a scheme which will work to the benefit both of student and practitioner. It is earnestly hoped that every member whose practice would afford opportunities for students to equip themselves with better practical knowledge of the diseases of farm animals will be willing to share in the task of improving the practical education of the veterinary surgeon of the future. If members will intimate to me their willingness to co-operate, I will at once pass on their names to the Principals of the schools.

Yours faithfully,

Fred Bullock,

Secretary, Royal College of Veterinary Surgeons.

18, Victoria Avenue,
Harrogate.
March 22nd, 1941.

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RED CROSS AND VETERINARY CHARITIES FUND

To the Editor of the Veterinary Record

Sir,—I enclose the final list of contributions to the above fund which closed at the end of February. The total amount collected is £47 4s. 0d. Of this sum £29 13s. 0d. has been allocated to the Red Cross and the

remaining £17 11s. 0d. to the Victoria Veterinary Benevolent Fund.

May I take this opportunity of thanking all who sent contributions to the fund. I am glad we were able to raise almost £50 in this way, my only regret being that the amount was not at least double.

List of Contributions

	£	s.	d.
Previous total	31	10	0
P. R. Turner	1	2	0*
A. L. Sheather	0	7	0*
J. McKinna and J. B. McKinna ...	2	10	0
A. Whicher (second donation) ...	0	12	0
Miss Joshua	0	15	0
J. J. Davies	5	9	0
T. A. R. Filgate	0	16	0
H. H. Frost (4th year student) ...	0	10	0
G. T. Williamson (final year student)	0	5	0
E. G. White (second donation) ...	2	8	0
J. Sprent	1	0	0
	£47	4	0

*These amounts were received from the refiners after the previous list of contributors had been sent and are additional to the amounts credited to these contributors in the previous list.

Yours faithfully,
E. G. White.

Research Institute in Animal Pathology,
Royal Veterinary College,
"The Beeches,"
Streatley, Berks.

March 22nd, 1941.

"PULPY KIDNEY DISEASE" IN SHEEP ON TURNIPS

To the Editor of the Veterinary Record

Sir,—In your notice of the Seventh Report of the Management Committee of Alan, Duke of Northumberland, Memorial Fund you say:—

> "It is interesting to note that there is a subheading to pulpy kidney disease, namely, 'Turnip sickness of Hoggs.' Although no account of further work on this problem is included . . . it is evident that *Cl. welchii*, Type D, entero-toxaemia has been found to exist in store sheep in the autumn and winter—presumably those being fattened on a turnip crop."

May I draw your attention to a series of cases (on different farms) of entero-toxaemia in yearling sheep as recorded by me in the *Veterinary Journal* three winters ago. These cases were verified by Dr. Montgomerie of the Wellcome Physiological Research Laboratories, and treatment was carried out by means of the "D" type serum with excellent results.

Having once had these sudden deaths in sheep diagnosed, it has been a routine business to detect and treat them every winter.

Yours faithfully,
J. W. Hall Masheter.

Ruddle House,
Newnham-on-Severn,
Gloucestershire.

March 15th, 1941.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT OF 1937 (PART IV)

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 16th to 28th Feb., 1941	14	16	6	489	—	3	11	63	34
Corresponding period in ...									
1940	23	25	5	1,177	1	2	25	131	61
1939	38	42	1	126	3	4	12	50	35
1938	32	33	9	2,867	3	5	5	10	1
Total 1st January to 28th Feb. 1941	88	96	77	8,850	4	11	74	440	211
Corresponding period in									
1940	104	116	12	2,179	8	15	74	658	349
1939	177	187	26	4,140	14	25	119	209	134
1938	171	177	101	14,559	25	34	66	66	27

Note.—The figures for the current year are approximate only. §Excluding outbreaks in Army Horses.

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.* herds officially certified as free from tuberculosis, as at 28th February, 1941, was as follows:— England 3,848 ... Wales 9,286 ... Scotland 3,225 ... Total (Great Britain) 16,359